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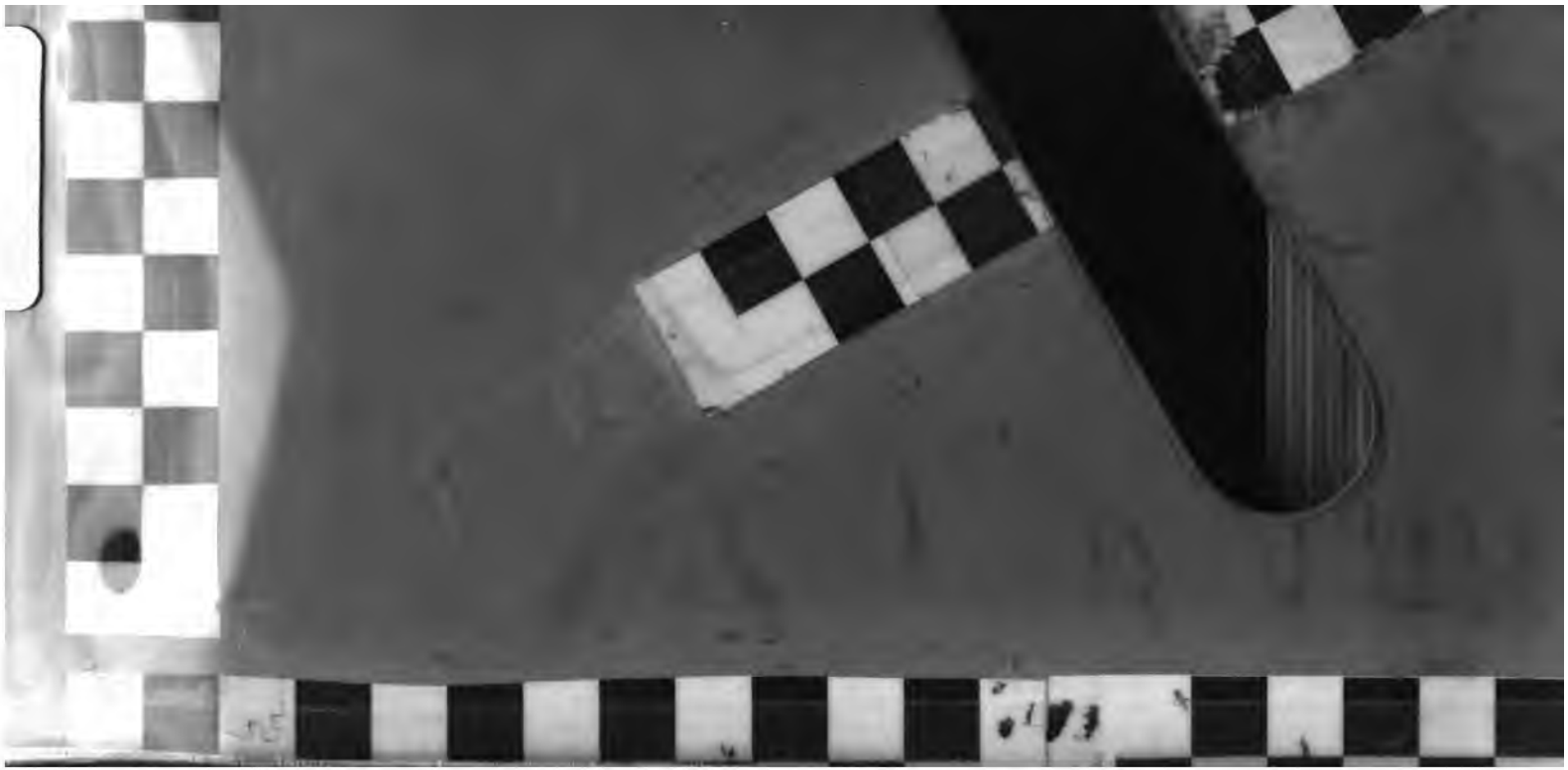

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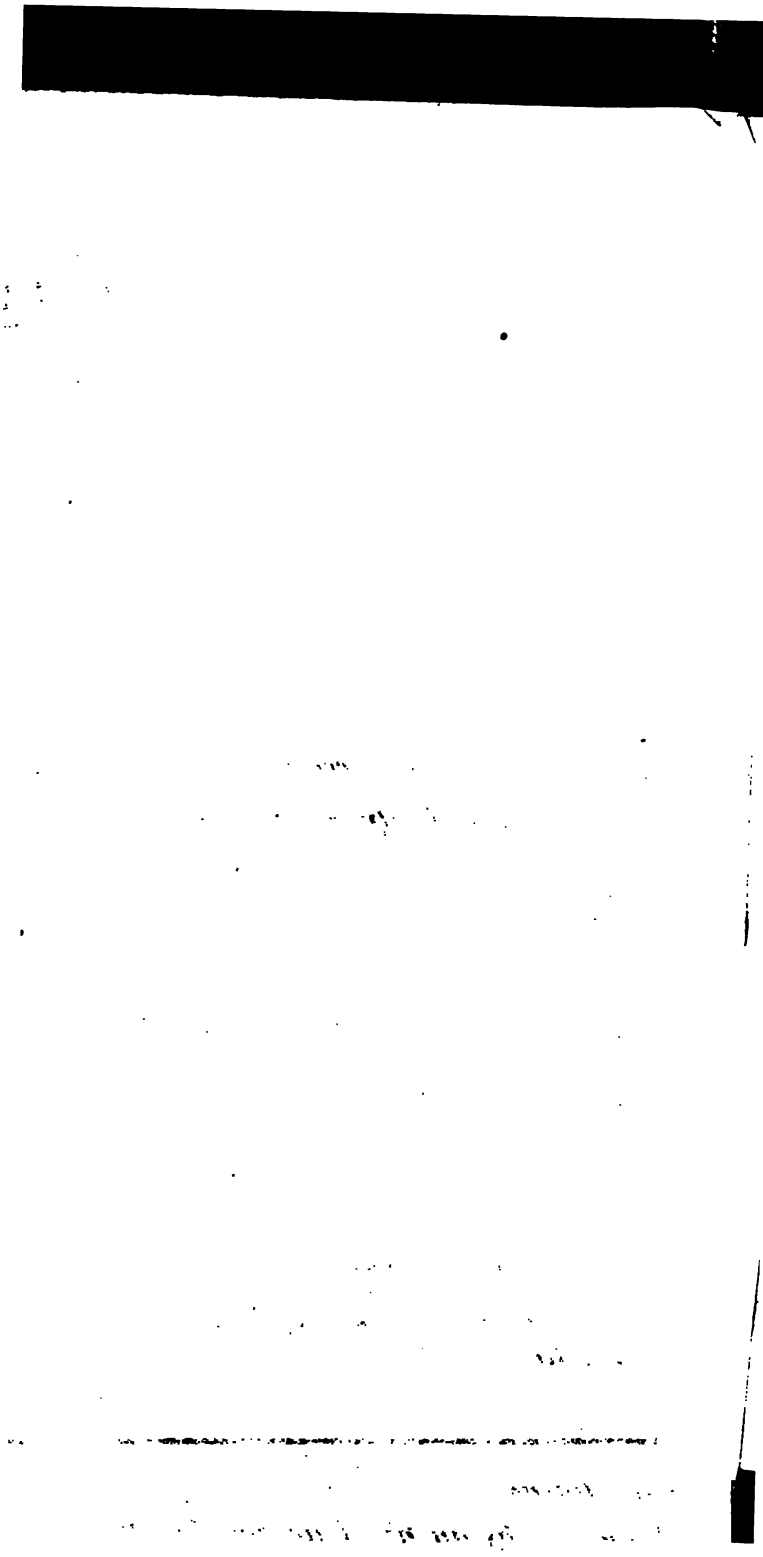

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REPORT

MADE AT THE REQUEST OF THE

Raccoon Coal and Iron Company,

GIVING THE RESULTS

OF

SEVERAL EXAMINATIONS,

MADE ON THE

LANDS OF THE COMPANY,

BY DAVID CHRISTY, GEOLOGIST,
OXFORD, OHIO.

Accompanied by a Map and Geological Section.

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CINCINNATI:
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ADVERTISEMENT.

On the 3d day of February, 1854, the Board of Directors of the Marietta and Cincinnati Railroad Company, in session in their office, in Chillicothe, passed the following resolutions, viz:

"*Resolved*, That, for the purpose of developing the coal mining business, along the line of our Road, this Board do proffer to convey the coal, for a period of ten years, which may be supplied by any responsible company or companies, with capital of not less than $100,000 each, which may, within sixty days be organized, and apply for the privilege, at the following rates, viz:

One cent per ton per mile, for any distance, not less that seventy-five miles;

One cent and a quarter per ton per mile, for any distance from fifty to seventy-five miles;

One cent and a half per ton per mile, for any distance less than fifty miles.

In order for a Company to avail itself of the above highly favorable terms, it will be necessary to apply to the President of the Railroad Company, Hon. W. P. CUTLER, Chillicothe, O., on or before the 4th day of April, 1854.

REPORT, &c.

In the selection of the Mineral Lands, on the Marietta and Cincinnati Railroad, for the *Raccoon Coal Company*, great caution has been used to avoid error. The examinations were undertaken in the month of March, 1853. The season of the year was favorable for calm and thorough investigation, Rival explorers were not likely to interrupt the work. The woods, denuded of their foliage, and the under growth "killed down" by the winter's frost, offered but little obstruction to a visual examination of the contour of the hills. Recent and heavy rains had washed the remains of vegetation from the gulleys and ravines, so that the various Geological strata could be readily observed in the profiles of the land surfaces.

By a careful examination of the whole country, bordering on the Railroad, from where that great highway enters the "Jackson Mineral Region," on its western border, eastwardly, to the town of Athens, it was found that the most desirable coal-beds, in contact with the road, lay along a portion of the valley of Big Raccoon Creek, and could be purchased.

But, before making any contracts, the results of my examinations were communicated to Seneca W. Ely, Esq., the Secretary of the Marietta and Cincinnati Railroad Company. That Company had previously appointed a committee to look up and purchase Coal Lands. This fact, known to Mr. Ely, suggested to him (zealously intent on benefiting the railway corporation,) a return with me to the Raccoon valley, to verify my discoveries; so that, if the facts were found to be, as stated

by me, the lands might be secured for the benefit of the railroad.

Mr. Ely, upon an examination which occupied him nearly a week, found the lands fully as desirable as represented. So thoroughly was he satisfied of their high value, intrinsically and relatively, that he at once entered with me into contracts, for the purpose of making my discoveries available to the railroad company. At the meeting of the Board of Directors next ensuing, the question of taking the contracts was affirmatively voted, by a majority of those present, but there lacking three of a full Board, (13,) a legal majority for authorizing pecuniary obligations of large amount, according to the By-laws of the Company, was not obtained. Subsequently, the contracts made, have been transferred to other parties, viz; the "*Raccoon Coal Company.*"

Since the reconnoissances above referred to, other examinations of these lands have been made, with results of increasing satisfaction. In one of these excursions, I enjoyed the pleasure and advantage, imparted by the companionship of U. P. JAMES, Esq., of Cincinnati, a good theoretical and field geologist. Mr. JAMES' conclusions, I was glad to find, in all important particulars, agreed with my own. About the same time, it was my good fortune to meet with Prof. BLAIR, of the Ohio University, Athens; whose residence within the "Mineral Basin," and thorough practical and scientific attainments, imparted to his opinions the highest value. My conference with this gentleman, also, heightened my confidence in my various examinations and conclusions.

The Coal Lands purchased by your Company, are situate on the line of the Marietta and Cincinnati Railroad, where that great "Through Line" enters the immediate valley of Big Raccoon, in Vinton county, and passes onward into Athens county, Ohio. At the point of crossing, the stream makes a sudden turn from a direction almost due South to the northeast, continuing the latter course, mainly, through the Company's lands, when both creek and road curve rapidly to the southeast, or in the direction of the dip of the coal, so that it

is soon lost below the beds of the streams. (See Geological Section.)

Hence, the geologist will perceive, that, on your lands, the creek *so cuts through the hills*, as to present the coal, and other mineral strata, in a position nearly horizontal and parallel with the grade of the railroad.

Your Lands lie within the townships of Elk, Madison and Brown, as laid down on the new maps; but on the older editions, referred to in the Ohio Geological Reports, are shown to be circumscribed within the townships of Elk, Lee, Brown and Waterloo.

There are three workable veins of coals, on these lands; two of which are above the level of the creek, and the third is from sixty to eighty feet below. The highest vein is identical with *the Nelsonville* coal, and is known in Vinton county as the *Buhr-stone* or *Limestone* vein. It has been fully described in the Ohio Geological Reports, by Prof. Briggs, the able assistant of Prof. Mather. (Prof. B., by the way, was so pleased with this Mineral Region, that he settled within it, as a practical miner and iron master.) That gentleman represents the vein in question, as "the most valuable deposit of coal on the western side of the coal basin." He says:

"This bed is one of the most valuable in the State, not only on account of its superior quality and its proximity to the water courses; but also for the facilities with which it can be obtained. Above it is a stratum of sandstone which, in most places, will form a permanent roof, when mines shall be opened. The coal is made up of laminar divisions so thin that several can be counted within the space of an inch; and between them, traces of vegetables can generally be observed. It contains some sulphuret of iron, but as it generally comes out in masses, and is not disseminated, the value of the coal is little impaired. The average thickness of this bed may be rated at six feet, but it varies from five to nine. As we descend the river from Nelsonville, it gradually *dips* [at the rate of about twenty-five feet to the mile,] and finally disappears below the bed of the Hocking about five miles below the former place.

* * * * * South of the Hocking valley, I have traced this coal over to the head waters of Raccoon, in York and Waterloo townships. Here it is somewhat thinner; and *south of this*, it is seen along the stream and branches before mentioned, in the townships of Lee, Brown and Vinton. In some places in the last township, it is below high-water mark; but in the southern part it is so elevated as to be easily wrought. It will be valuable, as it is associated with iron ore, on a stream, which, doubtless, at some day will be rendered navigable. This coal from its extent, will undoubtedly become the most valuable deposit on the western side of the coal-measures; and is destined to exert a powerful influence upon the prosperity of the part of the State which it traverses, as well as upon those which will be dependent on it for a supply of fossil fuel." *

This vein, (as above,) is found of its greatest thickness and value at Nelsonville, a thriving village, on the Hocking canal and river, some nine miles in a north-easterly direction from your lands. It is not yet fully opened anywhere on the purchase of the Raccoon Coal Company, and its greatest thickness has not yet been determined. In several places beneath the sandstone, in the bluffs, where it is exposed, it measures from three and a half, to over four and a half feet. Coal veins thus exposed, never present their full thickness at the surface, but have been more or less compressed by decomposition and the pressure of the overlying rocks. In other parts of Vinton county, where this vein is fully opened, it measures mostly from four to five, and five and a half feet. It maintains this thickness generally, as far south as Jackson county. As it is six feet thick at Nelsonville, on the north-east of the Company's lands, and from four to five feet on the south, it is certain that the vein must be of equal thickness on them.

From forty to sixty feet below the limestone vein, and running parallel with it, in all the hills, we find what may be called the *Splint Coal* vein. It is the middle one of the three coal beds in the Company's lands. This vein is described by

* Second Annual Report of the Geological Survey of Ohio, page 139.

Prof. Briggs, as having an average thickness of only two feet, in the Hocking valley; as variable in its character; and as having been wrought for smith's purposes, near Nelsonville.* It is not fully opened on the Company's lands, but in one place, in the bed of a small stream, which comes down from the highlands into Raccoon, it measures five feet and four inches in thickness. At two places, where it is partially opened, it indicates a thickness nearly equal to this. In fact, at a mine three miles from the line of the railroad, and north-west of the Company's lands, this vein is now opened, I am told, and presents a breast of beautiful coal from sixty to sixty-four inches in thickness. Your lands, over more than two-thirds of their area, *abound* with the coal of this vein, beyond all Geological doubt. It is this vein which will be mined to the greatest advantage, and with most convenience to the miner, as well as in reference to the railroad grade.

In tracing this vein to the west and south, *from Big Raccoon*, along the Railroad line, it is found to vary greatly, both in thickness and in quality. Generally, it is from one to two and three feet thick, and alternates from bituminous to cannel coal, sometimes one and sometimes the other predominating. In the Company's lands, the cannel and bituminous coal are *interlaminated*, so as to present the structure usually called *Splint Coal*. I feel assured that, nowhere on your lands, is this vein less than four feet in thickness.

Some of the inferior portions of this coal, were taken to Chillicothe, by persons who were unacquainted with its quality; and who had it tested, in the presence of Mr. Ely, when it was found to burn well. These "specimens" were from the bed of a ravine, over which a stream had flown every winter, decomposing and dissipating the calorific properties of the coal.

The lowest coal bed in these lands, is the same as the Jackson county coal, and may be called the *Jackson vein*. It is in high repute for the parlor and the forge. A specimen, taken from a mine that has long been worked, at a point about two and a half miles west of the Company's lands, has been ana-

* Second Annual Geological Report, page 138.

lyzed, in the laboratory of Dr. LOCKE of Cincinnati. It yields but three and thirty-two one-hundreths per cent of *ashes*, while it affords sixty-six and eighty-four one-hundreths per cent of *coke*. It can be worked on these lands only by a *vertical* shaft. It has been penetrated sixty feet below the water level, in boring a salt well, a mile and a half to the northeast; and is pronounced, by the gentleman engaged in the enterprise, as having a thickness of ten feet! This is doubtless an error; but as it is over four feet thick at a distance of two miles to the west, and must have a workable thickness at the salt well, on the northeast, there can be no *Geological* doubt but that it has an ample thickness for working on the Company's lands.

This vein does not occupy a position anywhere above the water level, on the line of the Marietta Railroad, except on the branches of Salt Creek, three or four miles west of Charleston [see map;] where it has been fully proved by a Chillicothe Company, and abandoned as too thin for working.

At and near Chauncey, a manufacturing town, with salt wells, mills, &c., six miles north of Athens, on the Hocking Canal, the "Nelsonville vein" of coal is mined, by shafting to the depth of 120 feet. It is stated, on the authority of A. B. WALKER, Esq., of Athens, who was a long time, and until very recently, an owner of Chauncey mines, that the expense of keeping a mine, at the above depth, clear of water, and raising the coal to the surface, is almost inappreciable in the course of a year's business. In England, as you well know, coal mining is prosecuted at depths of over 400 yards from the top of the ground—a necessity which the surface mines of Ohio will pretermit for the next one thousand years, at least.

The bearing of the Railroad line through the coal lands of the Raccoon Coal Company, is N. 35 degrees E. The line of the greatest *dip* of the strata is supposed to be S. 82 degrees E. The dip is about one inch to the rod, or twenty-seven feet to the mile. All the coal beds, therefore, which can be mined in a *western* direction, will drain themselves of their water, as they will have an *ascending* grade. In a northern or southern direction, the grade will be *horizontal;* while to the eastward,

it will be *descending*, or in the direction of the *dip*, and the water will follow the miners and drown them out, unless force pumps are employed, as in the mining by vertical shafts, where the coal is below the water level. Reference has been had, especially, to this point, in making purchases; and there are but a very few acres, in the whole, which cannot be mined either on an ascending or horizontal grade. At least three-fourths of the lands lie west of the railroad, and will give an *ascending* grade to the mining.

At the western side of the Company's lands, the middle vein is about forty feet above the grade of the railroad, and runs parallel with it, at a few rods distance, on the north, gradually but *slowly* dipping all the way to their eastern side, where it has sunk to the level of grade. Both these veins can mostly be so mined that the coal cars, when loaded, can be made to run down to the railroad track, without any other power than their own specific gravity. In shafting to the lowest vein, a position may be selected that will make a large part of the land *minable* from one entrance.

In passing westward from the Raccoon Coal Company's lands, the *Limestone vein*, or upper vein, where worked, maintains a thickness of three and a half to five feet, all along the hill tops adjacent to the railroad, as far as Charleston; but it is either in too limited areas, too distant from the road, or must be mined on a *descending* grade. As the *Splint Coal* and *Jackson vein*, both thin out *in this direction*, and are also almost valueless for mining at present; it must be apparent that the lands selected for the Company, combine all the advantages needed to secure success.

All the beds of iron ore common to Vinton and Jackson counties, are found along the line of the Marietta and Cincinnati Railroad; and most of them are above the water level on the Company's lands. The ore is presented in many places on the surface, but the thickness of the veins has not been proved. Five furnaces are in the process of erection near the line of the railroad, two of which are on lands contiguous to the Company's—one on the east and the other on the south-west. The

other three are within the same neighborhood, a little farther south. As the timber becomes exhausted, the furnaces must resort to coal for smelting iron, and then the splint coal and the coke of the Jackson vein will be the only reliance of the iron men. This will also be true of the fuel for locomotives on railroads.

The furnaces near the Marietta and Cincinnati railroad, some of which are only about going into blast, and all of which are new, *suggested*, as it were, by the construction of the road, are named, severally, Big Sand, Eagle, Iron Valley, Vinton, and (I believe) Charleston—the stack of the last mentioned being erected on Little Raccoon, 2 miles from Charleston, or Hamden village. They cost some $225,000 or $250,000, and evince probably a more rapid degree of development, in the way of mineral resources and manufacturing enterprise, than was ever before evinced on the same number of square miles. Besides Big Sand, there are two other large furnaces in successful operation, on the *northern* side of the M. and C. Railroad, viz: one near Nelsonville, owned by Messrs. Dille, Brice & Hayden, and the other in the town of Logan. Let any one take a map and look up the localities of these several furnaces. His conclusion must be inevitable, that your Company's lands abound as richly in ferruginous wealth as do those in their immediate neighborhood. It is asserted, on the authority of John Ballard and L. Jewett, Esqs., citizens of Athens, of the highest respectability, that the iron ore beds near Big Sand, 1½ miles from your lands, are in some places *three feet thick;* and Prof. Briggs describes one near McArthur as being four feet. A contract has been made to deliver at that furnace 60,000 tons of this ore, by the 1st of June next, the time the company anticipate to have an outlet by railway to a western market.

The opinion of Prof. Briggs, as to the value of the coal and iron on Big Raccoon creek, is fully sustained by the report of Prof. W. W. Mather, the State Geologist, in the Second Annual Report, 1838, page 8. Prof. M. says:

"The project of a canal up the Raccoon Creek, has been already under discussion, before the State Legislature. This

stream flows through a region rich in coal, buhr-stone and iron ore; and these natural products, *must, sooner or later, cause the construction of means of conveyance,* * for these materials to their proper markets. The same remarks apply to Symmes' and Leading creeks,† where coal abounds. Coal is so abundant in these regions, that it is considered of little value. It was so at Pittsburgh, a few years ago; but now, when the demand for it, for manufactures and domestic use, has increased beyond all their calculations, the value of coal-land has risen enormously. So it must be in Ohio, where they are favorably situated for transport or consumption. Some coal lands, on the banks of the Ohio river, where they were very favorably situated for working, have already sold at $600 per acre, and they have well repaid the outlay."

In this latter remark, Prof. M. alludes, of course, to Pomeroy.

The consumption of coal has increased, in the State of Ohio, even in a more rapid ratio than the population of our most flourishing towns and cities. In Cincinnati, for example, with the facilities for supply afforded by the Ohio, Monongahela, Big Sandy, and Kanawha rivers, the prices of mineral coal have rapidly risen, while this year, (1854) there has been great suffering, among the poor and improvident, for want of sufficient fuel, occasioned by the short "coal crop" there gathered. This fact appears paradoxical, to many—when it is undeniable, that natural stores of coal, to an exhaustless extent, may be found on the above rivers. But, when we take into consideration, 1st, the variable and uncertain navigation of the above rivers, caused by ice and drought; 2d, the cheap and flimsy craft in which the coal is floated; 3d, the rapidly increasing demand for mineral fuel *above* as well as *at* Cincinnati; 4th, the alarming proportion * of losses, both of human lives and boats, of those engaged in the trade; 5th, the large

* This was before Railroads were much talked of in the west. "The means of conveyance" are likely to be far more thorough and expeditious than were dreamed of by my learned and prophetic friend. D. C.

† These mines are in the counties of Lawrence and Meigs.

quantities of coal now used in the steam navigation of the "upper trade;" we can easily conjecture, that the great coal consuming marts of the Mad river and Miami's, including the smoky "Queen City," *need*, peremptorily, channels of supplies, which cannot be affected by the heats of summer nor the frosts of winter.

This sort of channel will be supplied your Company, in perfection, by the Marietta and Cincinnati Railroad Company. Their line extends from Cincinnati to Wheeling, through the towns of Chillicothe, Athens and Marietta; and the populous and flourishing counties of Clermont, Clinton, Highland, Ross, Jackson, Vinton, Washington, Monroe and Belmont. This railroad is two hundred and sixty miles long, and is under contract all the way. From Blanchester, in Clinton county, where the Marietta road crosses the line of the Hillsboro' and Loveland Railroad, to a point twenty-four miles east of Chillicothe, the M. and C. road is so nearly finished, ready for the iron, that a few weeks work, will suffice to complete the superstructure. Between Greenfield and the point indicated, (25 miles east of Chillicothe), the bridges are all erected, the superstructure completed, and a good portion of the iron laid. The rail is of the kind known among railroad men, as "Winslow's Compound Patent," weighing seventy-five pounds to the yard, being the heaviest rail in the state—procured with a view to carrying the heaviest freights with the utmost rapidity consistent with safety, and the least sacrifice of friction. The grades upon this long line nowhere exceed fifty feet to the mile; and there is no curvature of a less radius than two thousand eight hundred and sixty-five feet: these gradients and bends, in practical railroading, offer, in fact, *no obstruction*

*Of 200 coal boats which left Pittsburgh, Pa., early in January, 1854, 43 were lost in one night, that of Sunday, January 22d.

The Cincinnati Gazette estimates the loss of coal and coal boats in the severe storm of that Sunday night, at $55,000. The loss was all along the river, above and below Cincinnati. The Parkersburgh Gazette, says that seventy nine coal boats are known to have been lost out of two hundred and seventy that left Pittsburgh for Cincinnati, &c. Seventeen boatmen have lost their lives, twelve of whom belonged to Pittsburgh.

Subsequent estimates run the number of boats lost up to 100, with some twenty lives. The money loss was over $100,000, *all of which, of course, comes out of the pockets of coal consumers.*

to the most speedy and cheap locomotion and transportation.

The *connexions* of this road, on the west, are also highly favorable to the objects of your Company. The Dayton, Xenia, and Belpre Railroad is under contract, from the city of Dayton to the line of the Marietta road, a short distance west of Chillicothe, and will soon be ironed as far as Xenia. This road is constructing for the *express purpose* of enabling Dayton and the Upper Miami, and Mad River valleys, to reach the coal region, by the shortest, cheapest and most expeditious route.

2dly. The road projected, from Columbus, through Circleville and Chillicothe, *via* the valley of Paint creek, (the corn garden of the West) to Maysville, a portion of which is under contract, will extend your coal market in a *south western* direction.

3dly. The people of Hamilton, Rossville, Oxford, &c., have set their minds upon having a direct connexion with the Marietta road and the coal region, and will, doubtless, soon carry out their purpose by the way of Loveland's.

4thly. At Chillicothe, as you must be aware, the Marietta and Cincinnati Railroad crosses the Ohio and Erie Canal, at right angles, at a height most convenient for *dumping* coals into boats and scows for transportation north and south.

Thus, you may perceive, that even if the *Cincinnati* city coal market were sufficiently supplied from the Ohio river, there yet remains a vast scope of country, studded by populous and thriving towns, to which your miners may look for customers. As has been the case elsewhere, especially in the large cities on the Atlantic border, coal for fuel and manufacturing purposes *will make its own market*, as the supply is increased.

Your lands are valuable for agricultural purposes, and have long been improved by farmers. The site of Carbon City is a beautiful meadow of some 200 acres extent, which produces immense crops of hay. Your hill lands are fertile, as is well proved by the fine timber growing on the uncleared parts, and the wheat and corn crops on those which are cultivated. For all agricultural products, in this neighborhood, the furnaces and villages in the vicinity, even now, afford a highly remunerative

market. The soil of your lands, I have observed, is especially favorable to the growth of the *Irish Potato*, which is produced in Vinton county, in a degree of excellence equalled only by the sandy soils of northern Pennsylvania.

In the forests of this region, at a little distance east of your lands, but on soils of a much poorer quality, and of a different Geological origin, grows, abundantly, the *Chestnut oak*, the bark of which is so much sought for by leather manufacturers. Here, indeed, *the tanneries* are destined to be established, to which hides may be brought, from Cincinnati and elsewhere, for curing and dressing in the most thorough and economical manner.

Whether the Buhr-stone, with which this region abounds, will ever supersede, to a considerable extent, the use of the French article, is problematical; but it is quite certain that the quality of the Raccoon buhr is excellent, and the supply sufficient for the consumption of generations of millers.

I must not close, without reference to the existence of a desirable mill-site, on the western portion of the Company's lands, where the waters of the entire stream of Raccoon may be used for propelling purposes, immediately along side the railroad.

Appended, you will find a map and Geological section, illustrating the Geography and Geology of the vicinity of your coal lands. The hills, at their relative distances from the railroad, are accurately drawn from Jones' to N. Brewers'. They are omitted on the western end of the map as unimportant. Their distance from the road, and the position and quantity of the coal, have been alluded to already. The Geological section will afford a correct idea of the order in which the coal occurs along the railroad. It must be noted, however, that, for the greater portion of the distance from Charleston to Jones', it is too far from the road, or in too small areas in the hill tops, to be of much value for mining, except for local consumption. The map contains a table of distances to some of the more prominent points, where your coal and iron must find its markets.

I deem the locality of Carbon City well chosen, whether in reference to coal or manufacturing operations. The site is at a convenient distance from Charleston and McArthur, on the west, and Athens on the east; while its proximity to the Furnaces, must render it a place of commercial importance, if the object of its projectors be carried out with an ordinary degree of energy.

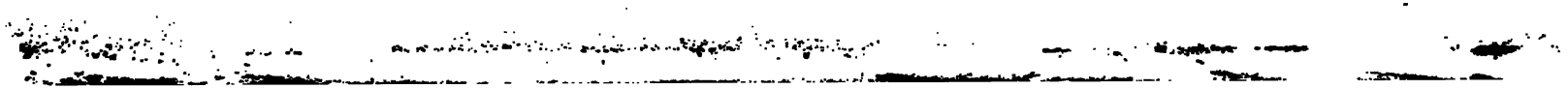
According to the estimate in the Ohio Geological Reports, a mile square of land embraces one million of tons of coal for each foot in thickness which it contains of that mineral. Allowing the three coal beds in your two thousand three hundred and seventy-five acres of lands, to average only 4½ feet each in thickness, the quantity of coal, owned by the Company, will be as follows:

The Jackson vein, underlying the whole, or 3.71 square miles, will embrace	Tons,	16,695,000
The Splint Coal vein, do. 1600 acres, or 2.5 do.		11,250,000
The Limestone vein, say, one third less,		7,500,000
Total tons,		35,445,000

The laws of Ohio estimate the ton to contain 28.57 bushels. Your lands, then, by this estimate, must contain over 912,660,000 bushels.

A 4½ foot vein of coal, according to the above rule, will contain 7,031 tons, or 200,877 bushels to the acre.

Oxford, O, Feb. 6, 1854. DAVID CHRISTY.



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